Analysing the Impact of Car Features on Price and Profitability

Project Description

- The automotive industry is shifting rapidly with a focus on fuel efficiency, environmental sustainability, and technological innovation. Electric and hybrid vehicles are becoming more popular, while traditional gasoline-powered cars remain dominant. As a Data Analyst, we can help car manufacturers optimize pricing and product development decisions by analysing the relationship between a car's features, market category, and pricing. By using data analysis techniques such as regression analysis and market segmentation, the manufacturer could develop a pricing strategy that balances consumer demand with profitability and identify which product features to focus on in future product development efforts

Tech Stack Used

Microsoft Excel 2021

- Data Cleaning
- Data Analysis
- Visualization
- Dashboard

Microsoft PowerPoint 2021

- Presentation

Project Approach

Understanding Data → Data Cleaning → Data Analysis → Data Visualization

Understanding Data

- Our data set contains details of Cars and their features and MSRP of Cars.
- Dataset is in the Format of csv.
- Dataset Contains 11915 rows and 16 Columns

Data Cleaning

Our Dataset Contained Blank Values in

- Fuel Type – Imputed with Online Data

Fuel Type			Imputation values
Make	Model	Year	Fuel Type
Suzuki	Verona	2004	Regular Unleaded
Suzuki	Verona	2004	Regular Unleaded
Suzuki	Verona	2004	Regular Unleaded

- No of Doors – Imputed with Values found for exact model or mode for particular car.

No Of Doors		
Make	Model	No of Doors
Ferrari	FF	2
Tesla	Model S	4
Tesla	Model S	4
Tesla	Model S	4
Tesla	Model S	4
Tesla	Model S	4

Engine HP – Had 69 Empty Values, Imputed with mode and Values found on the Internet

Make	Model	Year	Fuel Type	Engine HP - Mode	Online Values
FIAT	500e	2015	electric		111
FIAT	500e	2016	electric		111
FIAT	500e	2017	electric		111
Lincoln	Continental	2017	premium unleaded (recommended)	288	
Lincoln	Continental	2017	premium unleaded (recommended)	288	
Lincoln	Continental	2017	premium unleaded (recommended)	288	
Lincoln	Continental	2017	premium unleaded (recommended)	288	
Ford	Escape	2017	regular unleaded	175	
Ford	Escape	2017	regular unleaded	175	
Ford	Escape	2017	regular unleaded	175	
Ford	Escape	2017	regular unleaded	175	
Honda	Fit EV	2013	electric		123
Honda	Fit EV	2014	electric		123
Ford	Focus	2015	electric	157	
Ford	Focus	2016	electric	157	
Ford	Focus	2017	electric	157	
Ford	Freestar	2005	regular unleaded	199	
Ford	Freestar	2005	regular unleaded	199	
Ford	Freestar	2005	regular unleaded	199	
Ford	Freestar	2005	regular unleaded	199	
Ford	Freestar	2005	regular unleaded	199	
Ford	Freestar	2005	regular unleaded	199	
Mitsubishi	i-MiEV	2014	electric	66	
Chevrolet	Impala	2015	flex-fuel (unleaded/natural gas)	240	
Chevrolet	Impala	2015	flex-fuel (unleaded/natural gas)	240	
Chevrolet	Impala	2016	flex-fuel (unleaded/natural gas)	240	
Chevrolet	Impala	2016	flex-fuel (unleaded/natural gas)	240	
Chevrolet	Impala	2017	flex-fuel (unleaded/natural gas)	240	
Chevrolet	Impala	2017	flex-fuel (unleaded/natural gas)	240	
Nissan	Leaf	2014	electric		147
Nissan	Leaf	2014	electric		147
Nissan	Leaf	2014	electric		147
Nissan	Leaf	2015	electric		147
Nissan	Leaf	2015	electric		147
Nissan	Leaf	2015	electric		147
Nissan	Leaf	2015	electric		147
Nissan	Leaf	2016	electric		147
Nissan	Leaf	2016	electric		147
Nissan	Leaf	2016	electric		147
Mercedes-Benz	M-Class	2015	diesel	355	
Lincoln	MKZ	2017	regular unleaded	228	
Lincoln	MKZ	2017	regular unleaded	228	
Lincoln	MKZ	2017	regular unleaded	228	
Lincoln	MKZ	2017	regular unleaded	228	
Tesla	Model S	2014	electric		670
Tesla	Model S	2014	electric		670
Tesla	Model S	2014	electric		670
Tesla	Model S	2014	electric		670
Tesla	Model S	2015	electric		670
Tesla	Model S	2015	electric		670
Tesla	Model S	2015	electric		670
Tesla	Model S	2015	electric		670
Tesla	Model S	2015	electric		670
Tesla	Model S	2016	electric		670
Tesla	Model S	2016	electric		670
Tesla	Model S	2016	electric		670
Tesla	Model S	2016	electric		670
Tesla	Model S	2016	electric		670
Tesla	Model S	2016	electric		670
Tesla	Model S	2016	electric		670
Tesla	Model S	2016	electric		670
Toyota	RAV4 EV	2013	electric	176	
Toyota	RAV4 EV	2014	electric	176	
Kia	Soul EV	2015	electric		201
Kia	Soul EV	2015	electric		201
Kia	Soul EV	2016	electric		201
Kia	Soul EV	2016	electric		201
Kia	Soul EV	2016	electric		201

- Engine Cylinders – EV’s Don’t have a cylinder coz they run using motors. RX7 & RX8 Use a different type of engine called a rotary engine.

Engine Cylinders

Make	Model	Engine Cylinders
Chevrolet	Bolt EV	0
Chevrolet	Bolt EV	0
Volkswagen	e-Golf	0
Volkswagen	e-Golf	0
Volkswagen	e-Golf	0
Volkswagen	e-Golf	0
Mitsubishi	i-MiEV	0
Mitsubishi	i-MiEV	0
Mitsubishi	i-MiEV	0
Toyota	RAV4 EV	0
Mazda	RX-7	0
Mazda	RX-7	0
Mazda	RX-7	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0
Mazda	RX-8	0

- Had an outlier in highway mpg – 354, Imputed with 34 which is mode of particular model.

  Used a box plot to find the outlier

- Engine Fuel Type – Transformed Engine Fuel type.

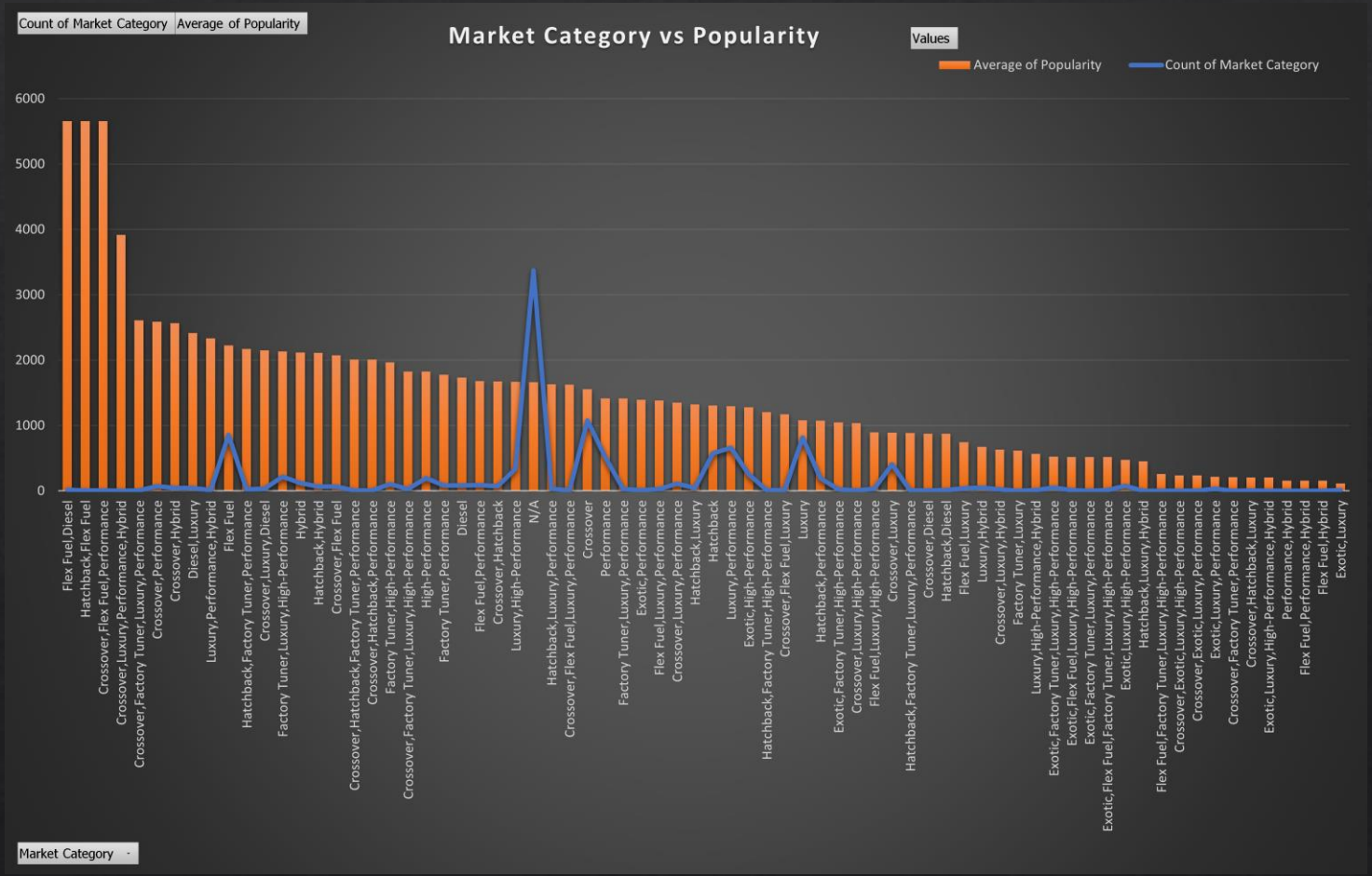
Engine Fuel Type	
Engine Fuel Type	Transformed
premium unleaded (required)	premium unleaded
premium unleaded (recommended)	premium unleaded
flex-fuel (unleaded/E85)	flex-fuel
flex-fuel (premium unleaded recommended/E85)	flex-fuel
flex-fuel (premium unleaded required/E85)	flex-fuel
flex-fuel (unleaded/natural gas)	flex-fuel

- Removed 715 duplicate entries

Data Analysis

Task 1:

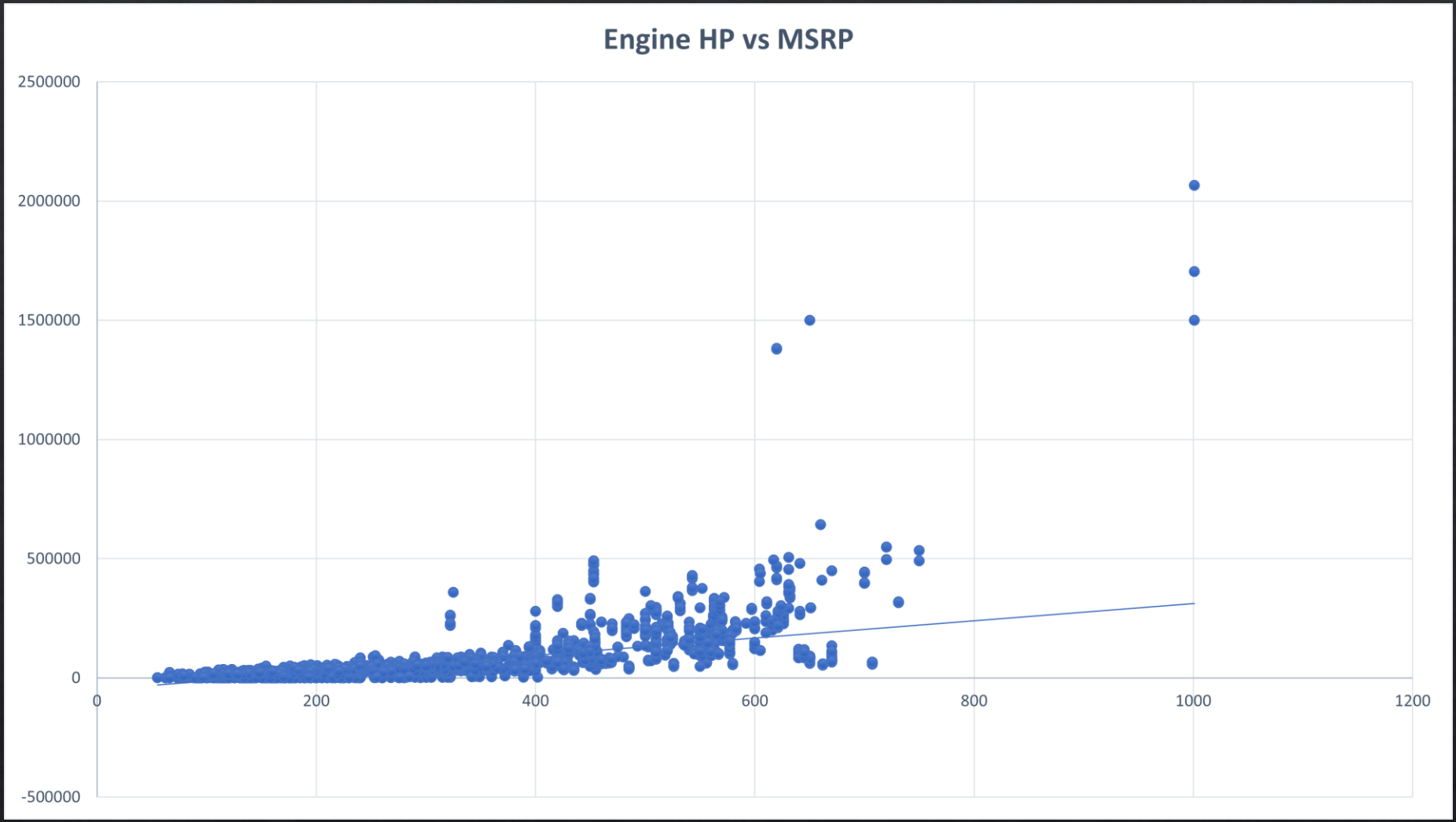
How does the popularity of a car model vary across different market categories?



N/A is ignored preserve the dataset's integrity.

Crossover's are the highest selling cars but Flex Fuel, Diesel have the highest Popularity Score and Exotic cars the least.

◈ Task 2: What is the relationship between a car's engine power and its price?



Engine Power and MSRP have a positive linear relation. The Higher the Engine power,
The higher the price of the car.
Exception: tesla has electric motors with which the car can make close 1000hp and also cost less.

Task 3 :Which car features are most important in determining a car's price?

SUMMARY OUTPUT

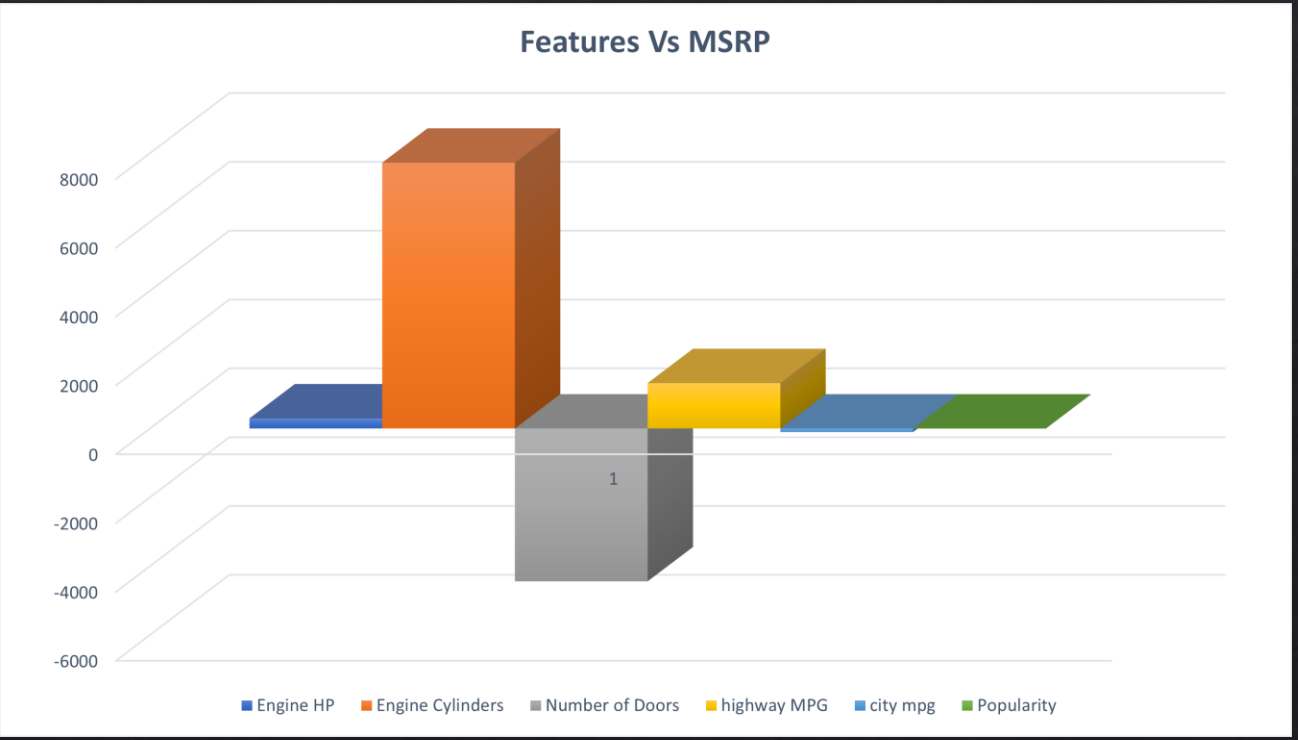
Regression Statistics	
Multiple R	0.678764735
R Square	0.460721565
Adjusted R Square	0.46044982
Standard Error	44152.58877
Observations	11914

ANOVA

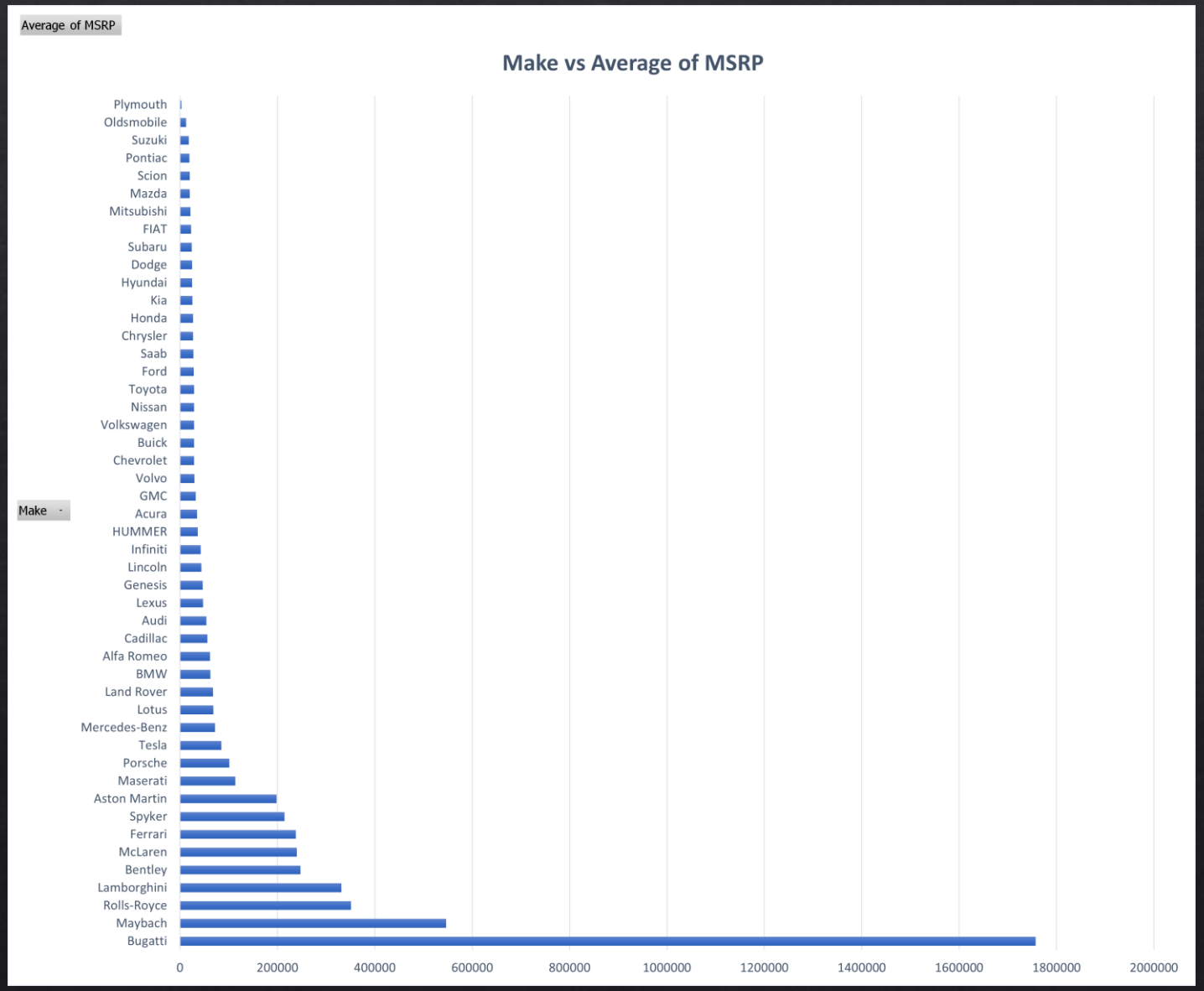
	df	SS	MS	F	Significance F
Regression	6	1.98308E+13	3.30513E+12	1695.417223	0
Residual	11907	2.32121E+13	1949451095		
Total	11913	4.30429E+13			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-89298.13533	3870.286734	-23.07274408	2.874E-115	-96884.52911	-81711.74155	-96884.52911	-81711.74155
Engine HP	294.7961646	5.686434758	51.84200245	0	283.6498243	305.942505	283.6498243	305.942505
Engine Cylinders	7724.137619	433.9108478	17.80120884	5.56225E-70	6873.601526	8574.673711	6873.601526	8574.673711
Number of Doors	-4440.912424	464.7194298	-9.556115236	1.46079E-21	-5351.838366	-3529.986482	-5351.838366	-3529.986482
highway MPG	1319.31517	156.6258871	8.423353218	4.0768E-17	1012.302864	1626.327476	1012.302864	1626.327476
city mpg	-103.2446228	134.3180693	-0.768657734	0.442111767	-366.5299643	160.0407188	-366.5299643	160.0407188
Popularity	-3.162007423	0.281613091	-11.22819758	4.15114E-29	-3.714015051	-2.609999796	-3.714015051	-2.609999796

Engine Cylinder and Highway MPG have the highest positive coefficient in determining MSRP.

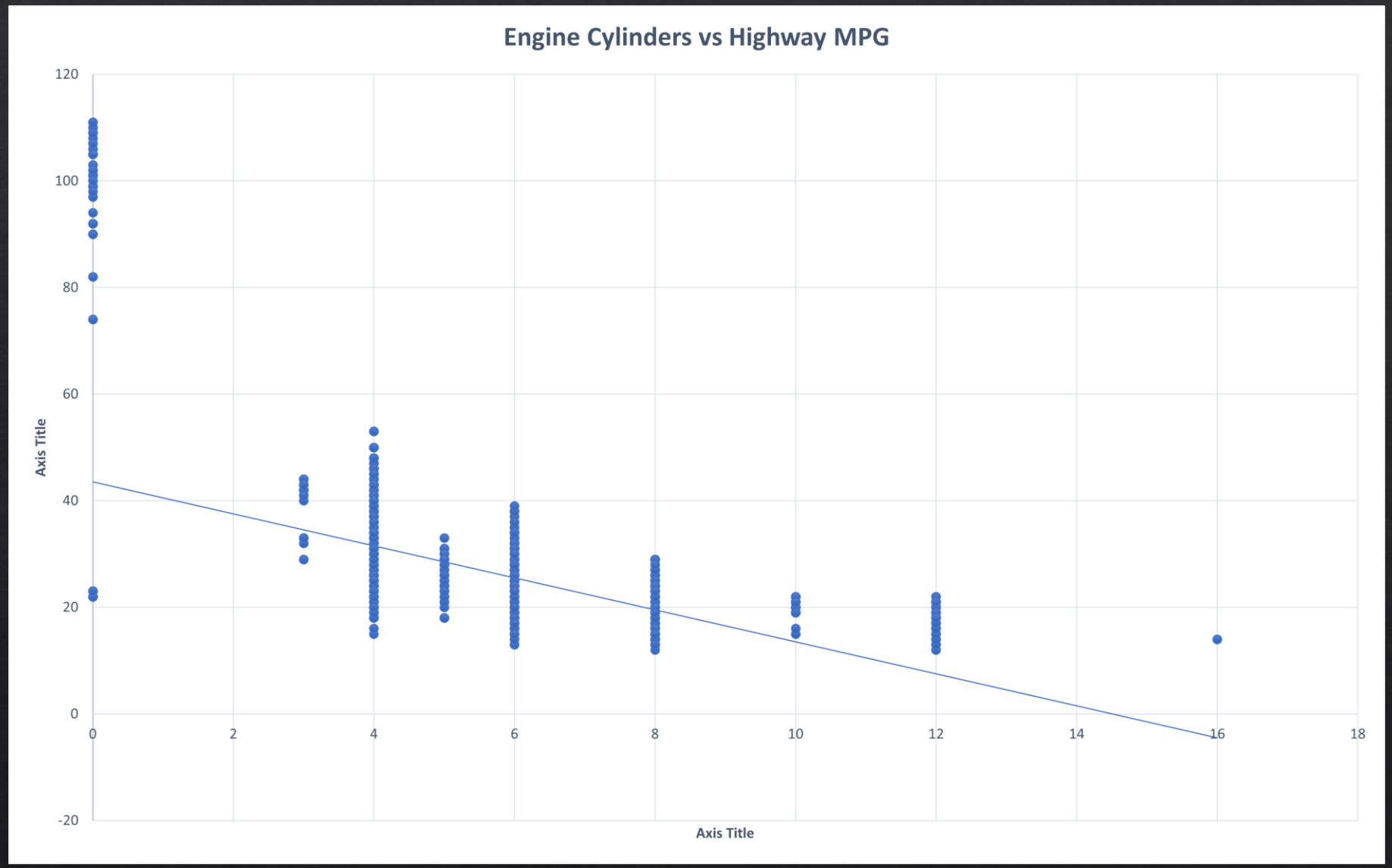


Task 4: How does the average price of a car vary across different manufacturers?



Luxury/Sports cars are some of the most expensive cars
Everyday/Cars for the masses are the once which are cheaper.

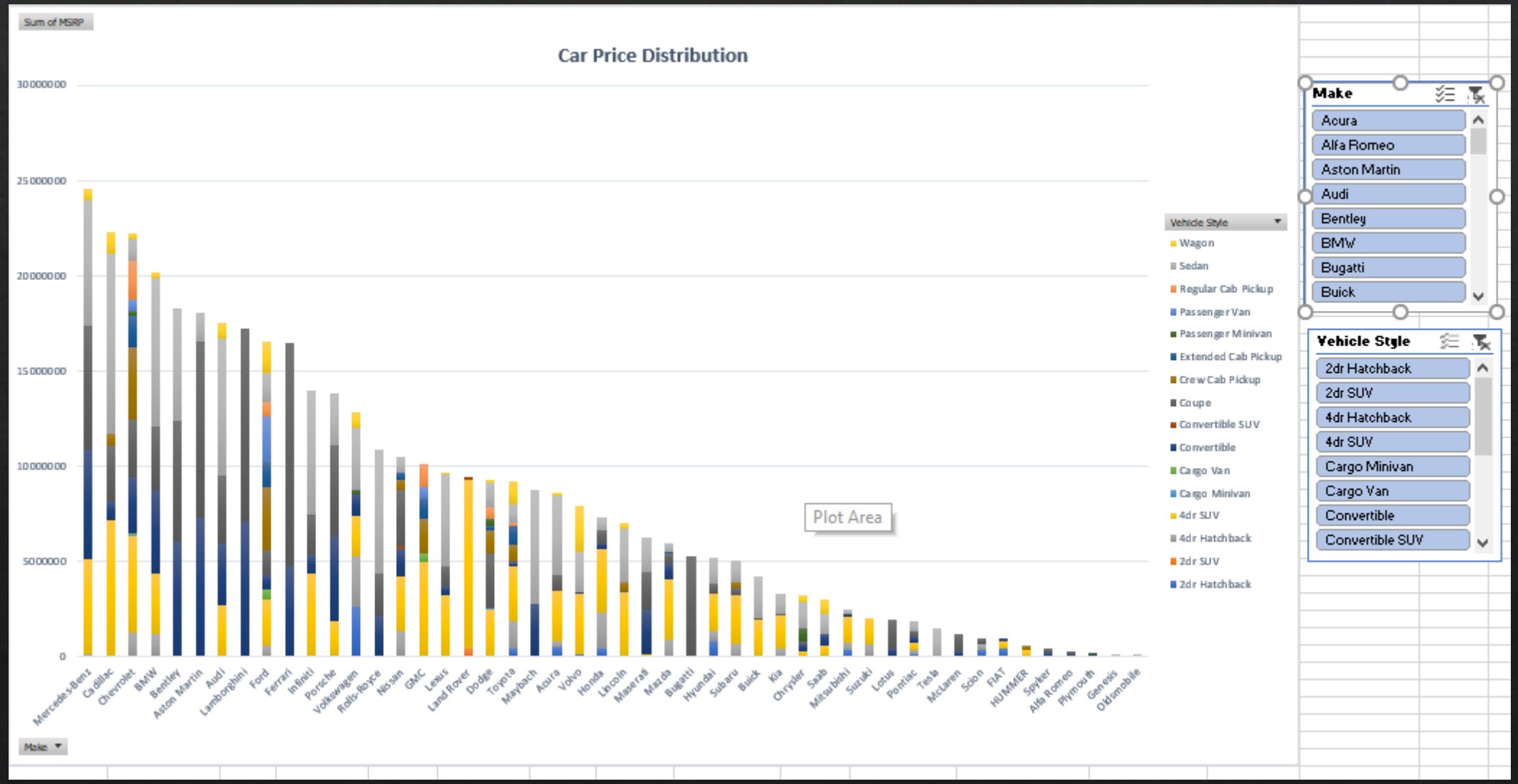
Task 5 : What is the relationship between fuel efficiency and the number of cylinders in a car's engine?



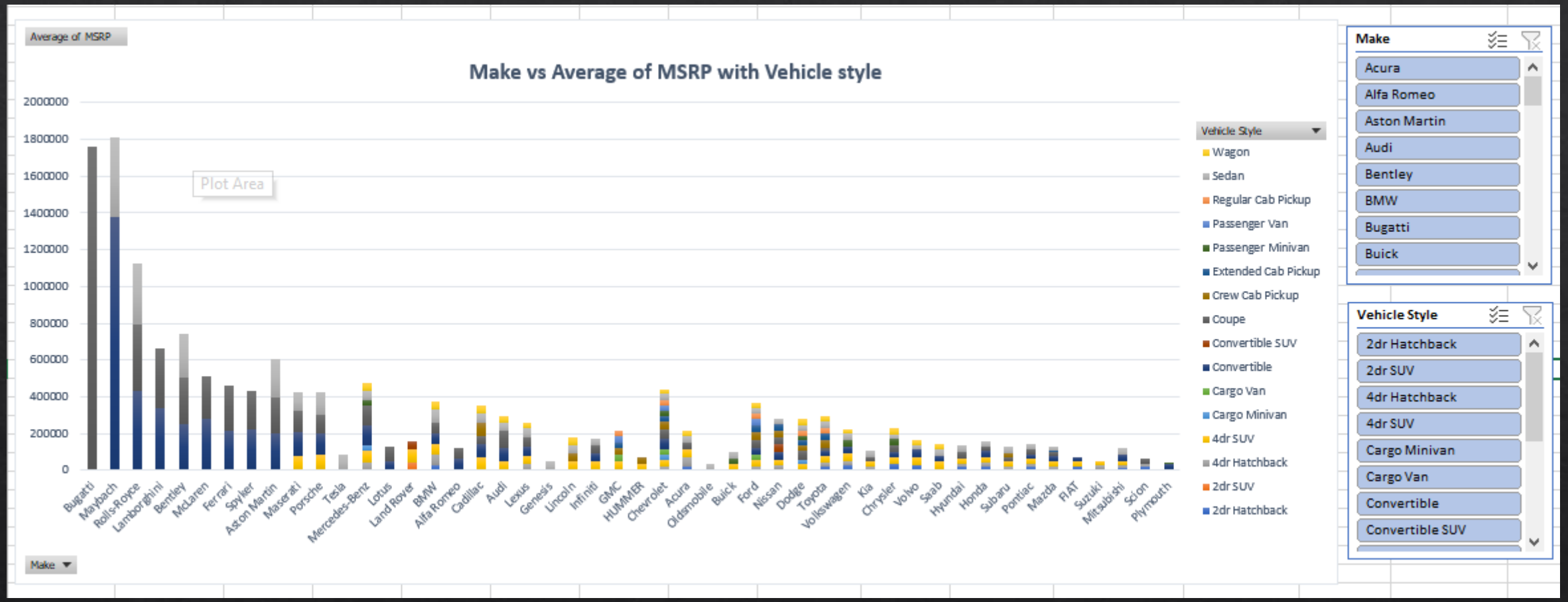
We clearly see that as the Number of cylinders increase, the efficiency decreases

Building the Dashboard

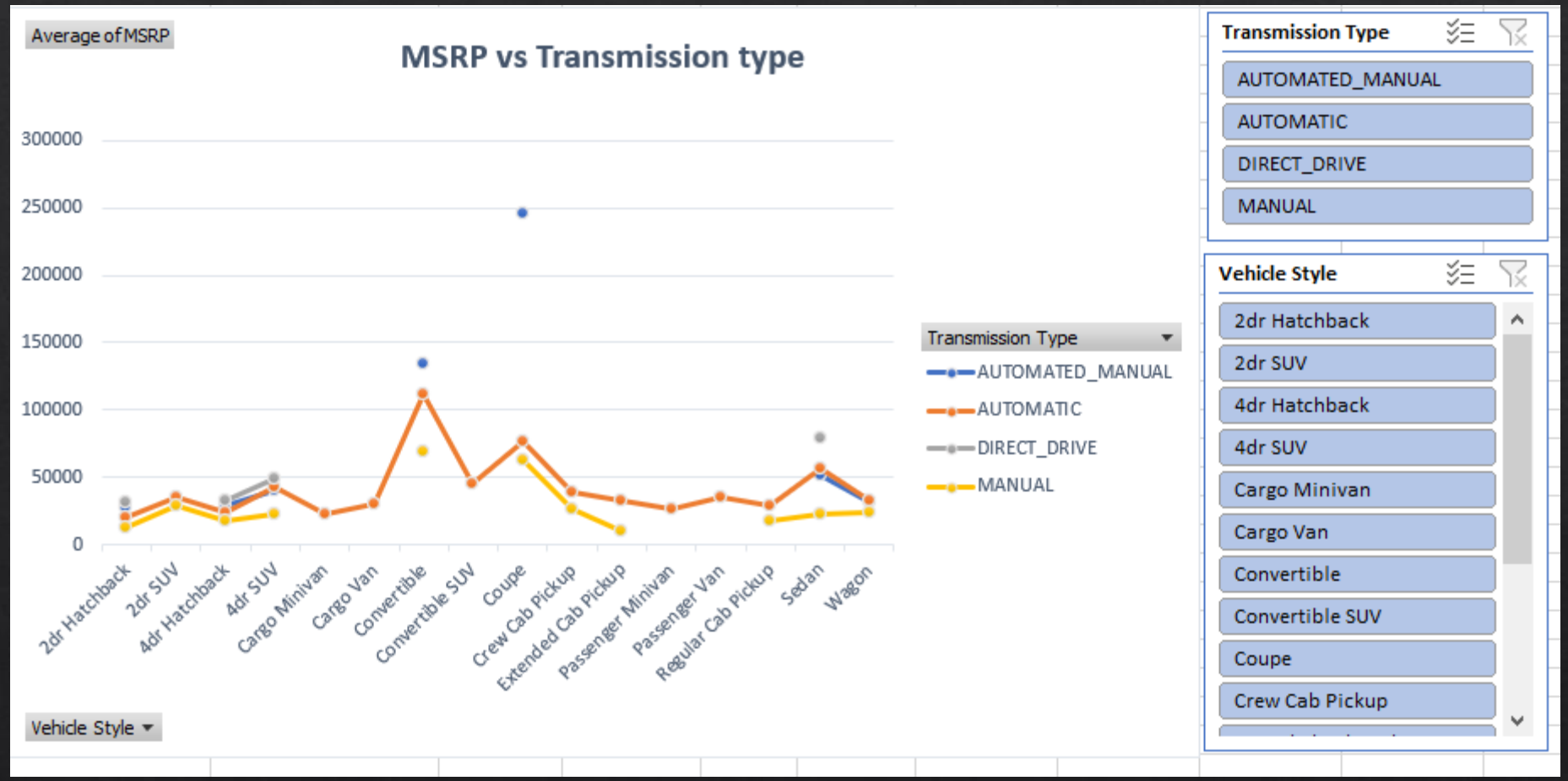
- Task 1: How does the distribution of car prices vary by brand and body style?



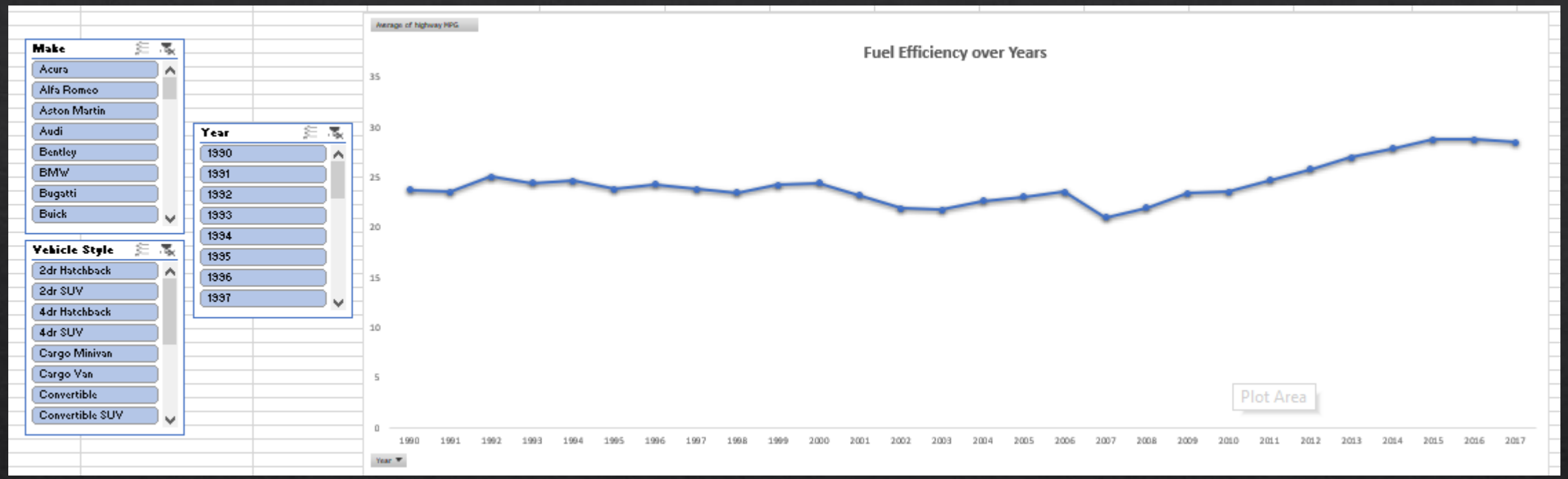
- Task 2 :Which car brands have the highest and lowest average MSRPs, and how does this vary by body style?



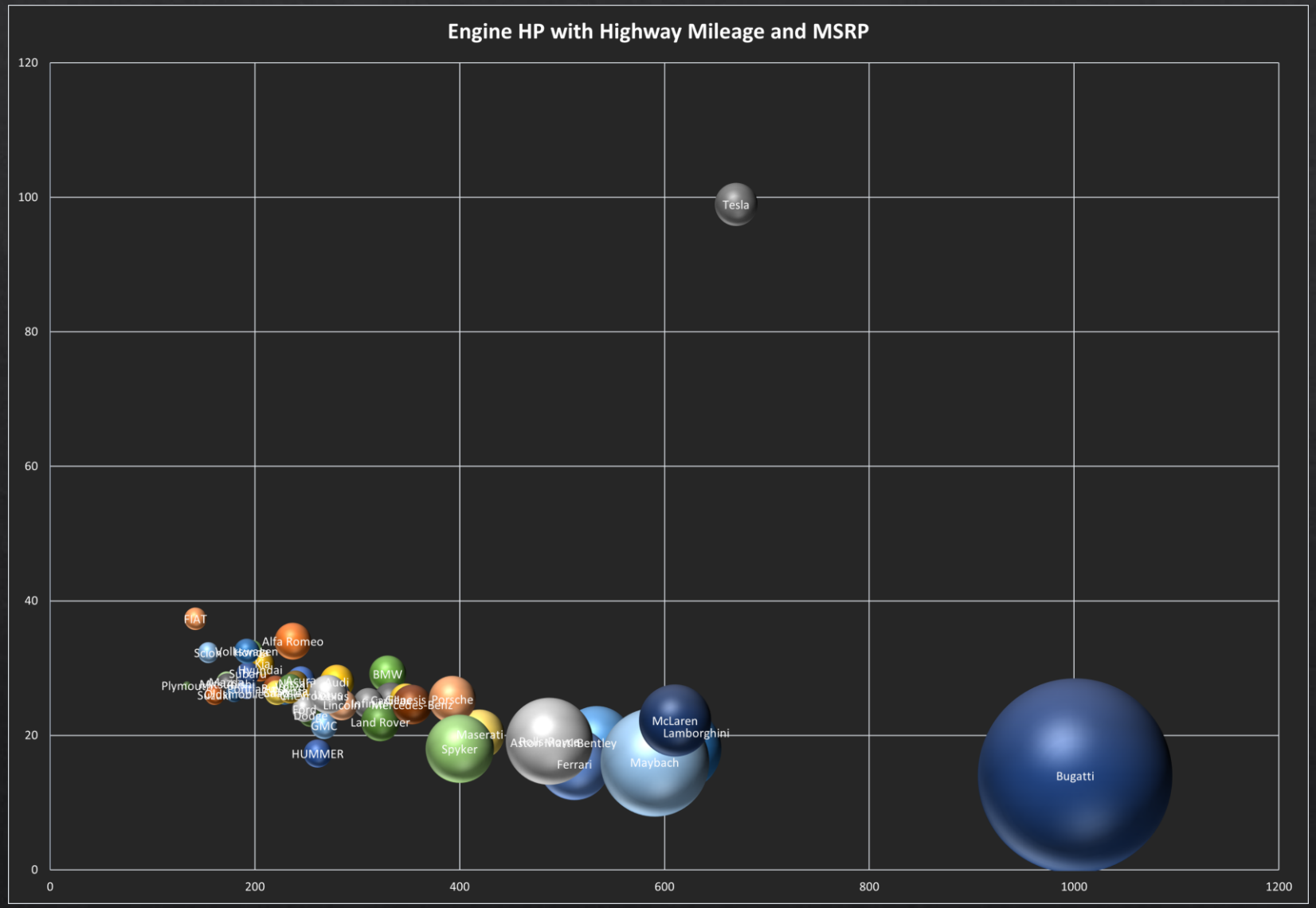
- Task 3 : How do the different feature such as transmission type affect the MSRP, and how does this vary by body style?



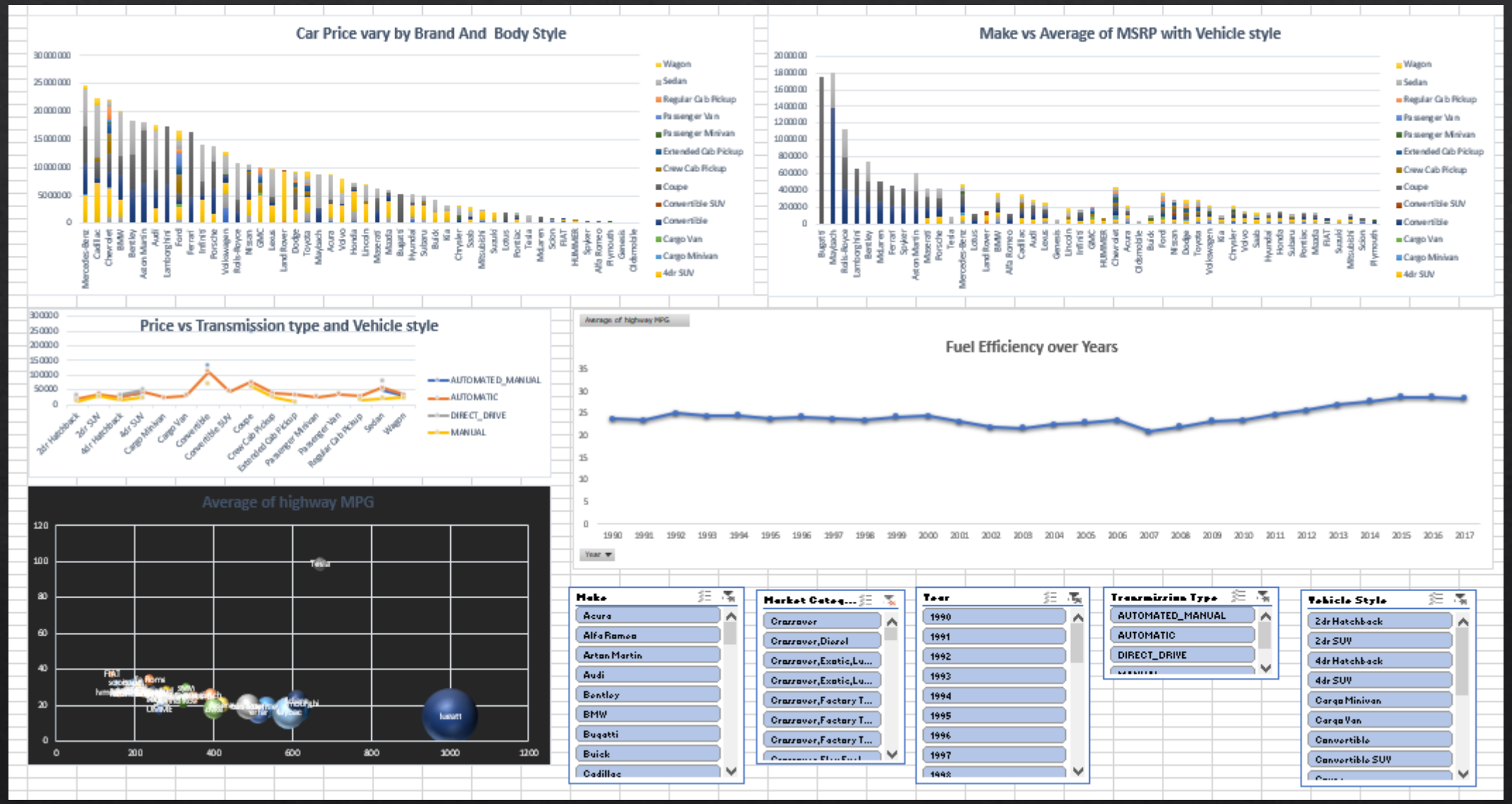
- Task 4: How does the fuel efficiency of cars vary across different body styles and model years?



Task 5: How does the car's horsepower, MPG, and price vary across different Brands?



Final Interactive Dashboard



Insights

- People in US like engine with higher horse power. As the engine power increases, so does the price.
- Engine Horse Power and Number of Cylinder a car has are the major contributors deciding the price followed by efficiency of the car.
- Exotic cars hold up their value and aspiration over the years.
- Electric cars tend to loose their value over the years.
- The efficiency of the car is inversely related to the Engine Horse Power and the Number of Cylinders. As the Power and No. of Cylinders increase, efficiency of the car decreases.
- US market is different from Indian market, Indian market is more price conscious. In India, people usually look for efficient cars and do not mind compromising on Engine HP or how big the engine is. But in US, people like big powerful cars.

Result

This project involved extensive use of Excel. Pivot tables were extensively used to accomplish the tasks. Major challenge was to understand the data to fill the NULL/Missing values and the data irregularities rather than just dropping the NULLs as they would have dropped particular car brands all together and the pricing for those would be unknown by the dealers. Creating dashboard and Regression Analysis helped me understand the factors affecting the car prices better. Over all the project was challenging and intuitive at the same time.